

REMARKS

Claims 1-15 are pending in the Application. Applicants have canceled claims 6-9, which were withdrawn from consideration. Consequently, claims 1-5 and 10-15 are pending. The drawings have objected to under 37 C.F.R. §1.83(a). Claims 5 and 15 are rejected under 35 U.S.C. §112, first paragraph. Claims 1-5 and 10-15 are rejected under 35 U.S.C. §112, second paragraph. Claims 10-15 are rejected under 35 U.S.C. §103(a). Applicants respectfully traverse these rejections for at least the reasons stated below and respectfully request the Examiner to reconsider and withdraw these rejections.

Applicants amended claims 1 and 10 not to overcome prior art but to more clearly describe the subject matter of an embodiment of the present invention. Applicants further note that claims 1, 4, 10, 11 and 14 have been amended to replace the phrase "ARC" with "anti-reflective coating" to prevent any potential trademark infringement and not to overcome prior art. Hence, no prosecution history estoppel arises from the amendments to claims 1, 4, 10, 11 and 14. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 62 U.S.P.Q.2d 1705, 1711-12 (2002); 56 U.S.P.Q.2d 1865, 1870 (Fed. Cir. 2000). Further, the amendments made to claims 1, 4, 10, 11 and 14 was not made for a substantial reason related to patentability and therefore no prosecution history estoppel arises from such amendments. *See Festo Corp.*, 62 U.S.P.Q.2d 1705 at 1707 (2002); *Warner-Jenkinson Co. v. Hilton Davis Chemical Co.*, 41 U.S.P.Q.2d 1865, 1873 (1997).

I. OBJECTIONS TO THE DRAWINGS:

The Examiner has objected to drawings under 37 C.F.R. §1.83(a). Paper No. 5, page 2. In particular, the Examiner asserts that the claim limitation of "etching said remaining portion of said anti-reflective coating layer", as recited in claim 1, is not shown in the drawings. Paper No. 7, page 2. Applicants respectfully direct the Examiner's attention to newly added Figure, Figure 3G, which illustrates etching the remaining portion of the anti-reflective coating layer. Consequently, the drawings

show every feature of an embodiment of the present invention specified in the claims. Therefore, Applicants respectfully request the Examiner to withdraw the objections to the drawings.

Applicants note that the newly added Figure, Figure 3G, is not new matter. Support for this new Figure, Figure 3G, is found at least on page 9, lines 1-7 of the Specification and at step 212 of Figure 2.

II. REJECTIONS UNDER 35 U.S.C. §112, FIRST PARAGRAPH:

The Examiner has rejected claims 5 and 15 under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement. Paper No. 7, page 3. In particular, the Examiner states:

Claim 5 and 15 recite: 'wherein said insulating material comprises thermal oxide'. However, claims 1 and 10 recited that the insulating material is deposited. The 'thermal oxide' is well known in the art to be thermal oxidation or thermally grown oxide. At most, the specification, page 7, lines 19-20, discloses: trench 14, is filled with an insulating material 18, e.g., thermal oxide, as illustrated in Figure 3A. How the thermal oxide is deposited? Paper No. 7, page 3.

Applicants have amended claims 1 and 10 to replace the phrase "depositing an insulating material in said trench" with the phrase "filling said trench with an insulating material". Applicants respectfully assert that the amendments to claims 1 and 10 more clearly describe the subject matter of an embodiment of the present invention and that amended claims 1 and 10 contain subject matter which was described in the specification in such a way as to enable one skilled in the art to make and/or use the invention. Consequently, Applicants respectfully request the Examiner to withdraw the rejections to claims 1 and 10 under 35 U.S.C. §112, first paragraph.

III. REJECTIONS UNDER 35 U.S.C. §112, SECOND PARAGRAPH:

The Examiner rejects claims 1-5 and 10-15 under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. Paper No. 5, page 4. In

particular, the Examiner states:

Claim 1, lines 9-11, recites: 'etching a portion of said anti-reflective coating layer over said STI region leaving a remaining portion of said anti-reflective coating layer over said STI region and extending beyond the boundaries of said STI region.' How can etching a portion of anti-reflective coating that lies over the STI region and still leaving the remaining portion of anti-reflective coating over the STI? Once removed, the anti-reflective coating is no longer situated over the STI, however, the limitation seems to indicate that nothing is removed or at most a top portion is removed. Paper No. 7, page 4.

Applicants respectfully contend that the scope of the claimed subject matter in claims 1-5 and 10-15 can be determined by one having ordinary skill in the art. In particular, Applicants respectfully contend that the limitation of "etching a portion of said anti-reflective coating layer over said STI region leaving a remaining portion of said anti-reflective coating layer over said STI region and extending beyond the boundaries of said STI region" as recited in claim 1 and similarly in claim 10 can be determined by one having ordinary skill in the art. Applicants respectfully direct the Examiner's attention to at least page 8, lines 1-3 of the Specification and Figure 3B as illustrating the etching of a portion of the anti-reflective coating layer over the STI region and leaving a remaining portion of the anti-reflective coating layer over the STI region and extending beyond the boundaries of the STI region. As illustrated in Figure 3B, a portion of the anti-reflective coating layer 34 was etched over the STI region 14 leaving a remaining portion of the anti-reflective coating layer 34 over the STI region 14. Furthermore, Figure 3B illustrates that the anti-reflective coating layer 34 extends beyond the boundaries of the STI region 14. Consequently, the scope of the above-cited claimed subject matter can be determined by one having ordinary skill in the art. Hence, claims 1-5 and 10-15 are allowable under 35 U.S.C. §112, second paragraph.

Furthermore, the Examiner has not provided any evidence that a person of ordinary skill in the art would not be able to determine the scope of the above-cited claim limitation. A rejection under 35 U.S.C. §112, second paragraph, is not appropriate, when the scope of the claimed subject matter can be determined by one

having ordinary skill in the art. M.P.E.P. § 706.03(d). As stated above, one having ordinary skill in the art can determine the scope of the claimed subject matter in claims 1-5 and 10-15. Consequently, Applicants respectfully assert that claims 1-5 and 10-15 are allowable under 35 U.S.C. §112, second paragraph, and respectfully requests the Examiner to withdraw the rejections of claims 1-5 and 10-15 under 35 U.S.C. §112, second paragraph.

The Examiner continues by stating:

Similarly, lines 12-14 recites: 'etching an exposed portion of said polysilicon layer said gate oxide layer over said STI region leaving a remaining portion of said polysilicon layer and said gate oxide layer over said STI region and extending beyond the boundaries of said STI region'. Paper No. 7, page 4.

Applicants respectfully contend that the scope of the claimed subject matter in claims 1-5 and 10-15 can be determined by one having ordinary skill in the art. In particular, Applicants respectfully contend that the limitation of "etching an exposed portion of said polysilicon layer and said gate oxide layer over said STI region leaving a remaining portion of said polysilicon layer and said gate oxide layer over said STI region and extending beyond the boundaries of said STI region" as recited in claim 1 and similarly in claim 10 can be determined by one having ordinary skill in the art. Applicants respectfully direct the Examiner's attention to at least page 8, lines 5-7 of the Specification and Figures 3B and 3C as illustrating the etching of an exposed portion of the polysilicon layer and the gate oxide layer over the STI region leaving a remaining portion of the polysilicon layer and the gate oxide layer over the STI region and extending beyond the boundaries of the STI region. As illustrated in Figure 3B, a portion of the polysilicon layer 32 and the gate oxide layer 34 is exposed over the STI region 14 as a result of etching anti-reflective coating layer 34 over a portion of the STI region 14. Further, as illustrated in Figure 3C, the exposed portion of the polysilicon layer 32 and the gate oxide layer 34 over the STI region 14 is etched leaving a remaining portion of the polysilicon layer 32 and the gate oxide layer 34 over the STI region 14. Furthermore, Figure 3C illustrates that the polysilicon layer 32 and the gate oxide layer 34 extends beyond the boundaries of the

STI region 14. Consequently, the scope of the above-cited claimed subject matter can be determined by one having ordinary skill in the art. Hence, claims 1-5 and 10-15 are allowable under 35 U.S.C. §112, second paragraph.

Furthermore, the Examiner has not provided any evidence that a person of ordinary skill in the art would not be able to determine the scope of the above-cited claim limitation. A rejection under 35 U.S.C. §112, second paragraph, is not appropriate, when the scope of the claimed subject matter can be determined by one having ordinary skill in the art. M.P.E.P. § 706.03(d). As stated above, one having ordinary skill in the art can determine the scope of the claimed subject matter in claims 1-5 and 10-15. Consequently, Applicants respectfully assert that claims 1-5 and 10-15 are allowable under 35 U.S.C. §112, second paragraph, and respectfully requests the Examiner to withdraw the rejections of claims 1-5 and 10-15 under 35 U.S.C. §112, second paragraph.

Furthermore, the Examiner states:

Claim 1 recites the limitation 'etching an exposed portion of said polysilicon layer and said gate oxide layer over said STI region' in lines 12-13. This is insufficient antecedent basis for this limitation in the claim. Paper No. 7, page 5.

Applicants respectfully traverse. The phrase "exposed portion" is preceded by an "an" and not a "said". Hence, "an exposed portion" has not been previously recited in claim 1. Applicants are confused as to how "an exposed portion" lacks sufficient antecedent basis. Applicants respectfully request the Examiner to clarify the rejection of the above-recited limitation pursuant to 37 C.F.R. §1.104(c)(2).

The Examiner further states:

Neither the polysilicon nor the gate oxide have been exposed, because the anti-reflective coating layer is still remaining over the STI region and extending beyond the boundaries of the STI region (See lines 9-11). Paper No. 7, page 5.

Applicants are assuming that the Examiner is rejecting claim 1 under 35 U.S.C. §112, second paragraph, because the Examiner alleges that the Specification does not

provide a sufficient description of the limitation "etching an exposed portion of said polysilicon layer and said gate oxide layer over said STI region" as recited in claim 1. Applicants respectfully traverse.

Applicants respectfully contend that the scope of the claimed subject matter in claims 1-5 can be determined by one having ordinary skill in the art. In particular, Applicants respectfully contend that the limitation of "etching an exposed portion of said polysilicon layer and said gate oxide layer over said STI region" as recited in claim 1 can be determined by one having ordinary skill in the art. Applicants respectfully direct the Examiner's attention to at least page 8, lines 1-7 of the Specification and Figures 3B and 3C as illustrating the etching of an exposed portion of the polysilicon layer and the gate oxide layer over the STI region. As illustrated in Figure 3B, a portion of the polysilicon layer 32 and the gate oxide layer 34 is exposed over the STI region 14 as a result of etching anti-reflective coating layer 34 over a portion of the STI region 14. Further, as illustrated in Figure 3C, the exposed portion of the polysilicon layer 32 and the gate oxide layer 34 over the STI region 14 is etched leaving a remaining portion of the polysilicon layer 32 and the gate oxide layer 34 over the STI region 14. Consequently, the scope of the above-cited claimed subject matter can be determined by one having ordinary skill in the art. Hence, claims 1-5 are allowable under 35 U.S.C. §112, second paragraph.

Furthermore, the Examiner has not provided any evidence that a person of ordinary skill in the art would not be able to determine the scope of the above-cited claim limitation. A rejection under 35 U.S.C. §112, second paragraph, is not appropriate, when the scope of the claimed subject matter can be determined by one having ordinary skill in the art. M.P.E.P. § 706.03(d). As stated above, one having ordinary skill in the art can determine the scope of the claimed subject matter in claims 1-5. Consequently, Applicants respectfully assert that claims 1-5 are allowable under 35 U.S.C. §112, second paragraph, and respectfully requests the Examiner to withdraw the rejections of claims 1-5 under 35 U.S.C. §112, second paragraph.

The Examiner further rejects claims 5 and 15 under 35 U.S.C. §112, second paragraph, for including the indefinite term "thermal oxide". Paper No. 7, page 5. Applicants respectfully direct the Examiner to Applicants' response to the rejections of claims 5 and 15 under 35 U.S.C. §112, first paragraph. Applicants believe that the amendments to claims 1 and 10, as discussed above, address these rejections. For at least the reasons noted above, Applicants respectfully request the Examiner to withdraw the rejections of claims 5 and 15 under 35 U.S.C. §112, second paragraph.

IV. REJECTIONS UNDER 35 U.S.C. §103(a):

The Examiner rejects claims 10, 11, 14 and 15 under 35 U.S.C. §103(a) as being unpatentable over Hsu et al. (U.S. Patent No. 6,197,637) (hereinafter "Hsu") in view of Yang et al. (U.S. Patent No. 6,110,779) (hereinafter "Yang"). The Examiner further rejects claims 12-13 under 35 U.S.C. §103(a) as being unpatentable over Hsu in view of Yang and in further view of Tripsas et al. (U.S. Patent No. 6,034,395) (hereinafter "Tripsas"). Applicants respectfully traverse these rejections for at least the reasons stated below and respectfully request the Examiner to reconsider and withdraw these rejections.

A. The Examiner has not provided any source of motivation for modifying Hsu with Yang.

The Examiner admits that Hsu does not teach "etching a trench in an STI region; filling said trench with an insulating material" as recited in claim 10. Paper No. 7, page 6. The Examiner modifies Hsu with Yang to include this missing limitation "because STI can be formed with narrow profile and devoid of bird's beak, hence more active surface area, thus more devices can be formed on a given semiconductor surface." Paper No. 7, page 7. The Examiner has not presented any source of motivation for modifying Hsu with Yang to include this missing limitation.

In order to support a *prima facie* case of obviousness, the Examiner must provide a source of motivation for modifying Hsu with Yang to include the above-stated missing limitations. M.P.E.P. §2142. The motivation to modify Hsu with Yang must come from one of three possible sources: the nature of the problem to be solved,

the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2d 1453, 1457-58 (Fed. Cir. 1998). The Examiner has not provided any evidence that his motivation comes from any of these sources. Instead, the Examiner is relying upon his own subjective opinion which is insufficient to support a *prima facie* case of obviousness. *In re Lee*, 61 U.S.P.Q.2d 1430, 1434 (Fed. Cir. 2002). Consequently, the Examiner's motivation is insufficient to support a *prima facie* case of obviousness for rejecting claims 10-15. *Id.*

B. The Examiner has not provided any objective evidence or motivation for modifying Hsu with Yang.

A *prima facie* showing of obviousness requires the Examiner to establish, *inter alia*, that the prior art references teach or suggest, either alone or in combination, all of the limitations of the claimed invention, and the Examiner must provide a motivation or suggestion to combine or modify the prior art reference to make the claimed inventions. M.P.E.P. §2142. The showings must be clear and particular and supported by objective evidence. *In re Lee*, 277 F.3d 1338, 1343, 61 U.S.P.Q.2d 1430, 1433-34 (Fed. Cir. 2002); *In re Kotzab*, 217 F.3d 1365, 1370, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000); *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). Broad conclusory statements regarding the teaching of multiple references, standing alone, are not evidence. *Id.*

As stated above, the Examiner admits that Hsu does not teach "etching a trench in an STI region; filling said trench with an insulating material" as recited in claim 10. Paper No. 7, page 6. The Examiner modifies Hsu with Yang to include this missing limitation "because STI can be formed with narrow profile and devoid of bird's beak, hence more active surface area, thus more devices can be formed on a given semiconductor surface." Paper No. 7, page 7. The Examiner's motivation is insufficient to establish a *prima facie* case of obviousness for at least the reasons stated below.

The Examiner's motivation does not address as to why one of ordinary skill in

the art would modify Hsu with Yang to etch a trench in an STI region and fill the trench with an insulating material. Simply stating "because STI can be formed with narrow profile and devoid of bird's beak, hence more active surface area, thus more devices can be formed on a given semiconductor surface" does not provide a motivation or suggestion for modifying Hsu with Yang to etch a trench in an STI region and fill the trench with an insulating material. The Examiner has provided no connection between etching a trench in an STI region and filling the trench with an insulating material with the statement "because STI can be formed with narrow profile and devoid of bird's beak, hence more active surface area, thus more devices can be formed on a given semiconductor surface." Instead, the Examiner is merely relying upon his own subjective opinion which is insufficient to establish a *prima facie* case of obviousness in rejecting claims 10-15. *In re Lee*, 61 U.S.P.Q.2d 1430, 1434 (Fed. Cir. 2002). The Examiner must provide objective evidence to support a motivation or a suggestion for modifying Hsu with Yang to provide a plurality of semiconductor memory devices on a die. *Id.* Since the Examiner has not provided such evidence, the Examiner has not presented a *prima facie* case of obviousness in rejecting claims 10-15. *Id.*

C. By modifying Hsu with Yang, the principle of operation of Hsu would change.

If the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 370 F.2d 810, 123 U.S.P.Q. 349 (C.C.P.A. 1959). Further, if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984). For the reasons discussed below, Applicants submit that by modifying Hsu with Yang, the principle of operation in Hsu would change and subsequently render the operation of Hsu to perform its purpose unsatisfactorily.

Hsu teaches a method for fabricating a non-volatile memory cell for a substrate includes the following steps: forming an isolation structure to define an active region on the substrate; forming a channel oxide layer on the active region; forming a conducting layer and a silicon nitride layer over the substrate; defining the polysilicon layer and the silicon nitride layer to form a floating gate on the active region and to form an opening exposing a portion of the isolation structure; conformally forming an etching protection layer which extends from the isolation structure inside the opening up to the silicon nitride layer; forming an oxide layer over the substrate; planarizing the oxide layer to the surface of the silicon nitride layer so that the remainder of the oxide layer is left within the opening; removing the silicon nitride layer; forming conducting spacers on the sidewalls of the remainder of the oxide layer; removing the remainder of the TEOS oxide layer; conformally forming an ONO layer; forming a controlling gate on the ONO layer; and forming source/drain regions. Abstract. Hsu further teaches that a method for improving the gate coupling ratio of a non-volatile memory cell in fabrication. Column 1, lines 8-10. Hsu further teaches that the prior art for improving the gate coupling ratio of a non-volatile memory cell mainly utilizes the polysilicon spacers formed by the liquid phase deposition process to increase the surface area of the insulating region between the floating gate and the controlling gate. Column 2, lines 17-23. Hsu further teaches that the main disadvantage of the foregoing prior art is that the process is complicated and difficult to control. Column 2, lines 25-26.

Yang, on the other hand, teaches forming a resist mask pattern having a reduced thickness overlying on a silicon oxynitride film during formation of a memory gate. Abstract. Yang further teaches methods and arrangements for etching a polysilicon gate layer in a memory device. Column 1, lines 10-12. Yang further teaches that the use of a thick resist layer having a thickness of about 9700 Angstroms causes alignment problems in that the process margin for properly overlaying the resist mask pattern with the isolation region is very small. Column 3, lines 14-17. Yang further teaches that there is a need for an arrangement for etching a polysilicon gate layer during formation of a channel implant mask that improves yield and

process margins by reducing the necessary thickness of the photoresist mask pattern. Column 3, lines 25-28.

By combining Hsu with Yang, Hsu would no longer be able to improve the gate coupling ratio of a non-volatile memory cell in fabrication. Hsu would be modified by Yang to instead form a resist mask pattern having a reduced thickness overlying on a silicon oxynitride film during formation of a memory gate. Yang teaches forming a resist mask pattern having a reduced thickness overlying on a silicon oxynitride film during formation of a memory gate. Yang further teaches that the purpose of its invention is to arrange for etching a polysilicon gate layer during the formation of a channel implant mask that improves yield and process margins by reducing the necessary thickness of the photoresist mask pattern. Hsu, on the other, teaches the purpose of its invention is to improve the gate coupling ratio of a non-volatile memory cell in fabrication. Hsu further teaches the steps in its Abstract in improving the gate coupling ratio. However, none of those steps are performed in Yang whose purpose is contrary to Hsu's purpose. Hence, by combining Hsu with Yang, Hsu would be modified to form a resist mask pattern having a reduced thickness overlying on a silicon oxynitride film during formation of a memory gate instead of improving the gate coupling ratio of a non-volatile memory cell in fabrication. Thus, by modifying Hsu with Yang, the principle of operation in Hsu would change, and subsequently render the operation of Hsu to perform its purpose unsatisfactorily. Therefore, the Examiner has not presented a *prima facie* case of obviousness for rejecting claims 10-15. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (C.C.P.A. 1959); *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984).

D. The Examiner has not presented a reasonable expectation of success when combining Hsu with Yang.

The Examiner must present a reasonable expectation of success in combining Hsu with Yang in order to establish a *prima facie* case of obviousness. M.P.E.P. §2143.02.

As stated above, Hsu teaches improving the gate coupling ratio of a non-volatile memory cell mainly utilizes the polysilicon spacers formed by the liquid phase deposition process to increase the surface area of the insulating region between the floating gate and the controlling gate. Column 2, lines 17-23.

Yang, on the other hand, teaches forming a resist mask pattern having a reduced thickness overlying on a silicon oxynitride film during formation of a memory gate. Abstract.

The Examiner has not presented any evidence that there would be a reasonable expectation of success in modifying Hsu, which teaches improving the gate coupling ratio of a non-volatile memory cell, with Yang, which teaches forming a resist mask pattern having a reduced thickness overlying on a silicon oxynitride film. The Examiner must provide objective evidence as to how Hsu, which teaches improving the gate coupling ratio of a non-volatile memory cell, would be combined with Yang, which teaches forming a resist mask pattern having a reduced thickness overlying on a silicon oxynitride film. M.P.E.P. §2143.02. Since the Examiner has not provided such evidence, the Examiner has not presented a reasonable expectation of success in combining Hsu with Yang. M.P.E.P. §2143.02. Accordingly, the Examiner has not presented a *prima facie* case of obviousness in rejecting claims 10-15. M.P.E.P. §2143.02.

E. Hsu and Yang, taken singly or in combination, do not teach or suggest the following claim limitations.

Applicants respectfully assert that Hsu and Yang, taken singly or in combination, do not teach or suggest "etching a trench in an STI region; filling said trench with an insulating material" as recited in claim 10. The Examiner cites element 76 and Figure 4 as teaching the above-cited claim limitations. Paper No. 7, page 7. Applicants respectfully traverse and assert that Yang instead teaches that although Figure 3C discloses the isolation regions 14a and 14b as field oxidation regions, the structure may alternatively use trench isolation structures 76, as shown in Figure 4. Column 6, lines 24-26. There is no language in Yang that teaches etching a

trench in a shallow trench isolation region. Applicants have performed a search of the term "STI" and was unable to identify this term or any variation thereof. Applicants further performed a search in Yang of the phrase "shallow trench" and were unable to identify this phrase or any variation thereof. Further, there is no language in the description of Figure 4 that teaches filling the trench (Examiner asserts that element 76 teaches the trench claimed) with an insulating material. Therefore, the Examiner has not presented a *prima facie* case of obviousness in rejecting claim 10, since the Examiner is relying upon an incorrect, factual predicate in support of the rejection. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998).

Applicants further assert that Hsu and Yang, taken singly or in combination, do not teach or suggest "depositing an anti-reflective coating layer over said STI region and extending beyond the boundaries of said STI region" as recited in claim 10. The Examiner cites element 241a of Hsu as teaching an anti-reflective coating. Paper No. 7, page 6. The Examiner though does not cite an element in Hsu as teaching an STI region. In order to establish a *prima facie* case of obviousness, the Examiner must cite a reference or combination of references that teaches or suggests all of the claim limitations. M.P.E.P. §2142. Since the Examiner has not cited a passage in Hsu or in combination with Yang as teaching the above-cited claim limitation, the Examiner has not presented a *prima facie* case of obviousness in rejecting claim 10. M.P.E.P. §2143.

Applicants further assert that Hsu and Yang, taken singly or in combination, do not teach or suggest "etching a portion of said anti-reflective coating layer over said STI region leaving a remaining portion of said anti-reflective coating layer over said STI region and extending beyond the boundaries of said STI region" as recited in claim 10. The Examiner cites elements 241a and 242 of Hsu as teaching the above-cited claim limitation. Paper No. 7, page 6. Applicants respectfully traverse and assert that Hsu instead teaches that a conducting layer (element 240a) and an insulating layer (element 241a) are sequentially formed over the semiconductor substrate (element 210). Column 3, lines 41-43. Hsu further teaches depositing a silicon nitride layer on the insulating layer (element 241a). Column 3, lines 45-47.

Hsu further teaches that through exposure and photolithography processes, a patterned photoresist and an opening (element 242) exposing a portion of the surface of the silicon nitride layer are formed. Column 3, lines 48-51. Hence, Hsu teaches exposing a portion of the silicon nitride layer deposited on the insulating layer. Figure 5B of Hsu illustrates that opening 242, as taught by Hsu, does not include exposing a portion of insulating layer 241a. Thus, there is no language in Hsu that teaches etching a portion of an anti-reflective coating layer (Examiner asserts that element 241a of Hsu teaches an anti-reflective coating layer). Neither is there any language in Hsu that teaches etching a portion of an anti-reflective coating layer over an STI region. Neither is there any language in Hsu that teaches etching a portion of an anti-reflective coating layer over an STI region leaving a remaining portion of the anti-reflective coating layer over the STI region. Neither is there any language in Hsu that teaches etching a portion of an anti-reflective coating layer over an STI region leaving a remaining portion of the anti-reflective coating layer over the STI region and extending beyond the boundaries of the STI region. Therefore, the Examiner has not presented a *prima facie* case of obviousness in rejecting claim 10, since the Examiner is relying upon an incorrect, factual predicate in support of the rejection. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998).

Applicants further assert that Hsu and Yang, taken singly or in combination, do not teach or suggest "depositing a protective cap covering said STI region and extending beyond the boundaries of said STI region, wherein said protective cap covers said remaining portion of said anti-reflective coating layer and said insulating material over said STI region" as recited in claim 10. The Examiner cites element 230 as teaching both an STI region and an insulating material. Paper No. 7, page 6. Applicants respectfully traverse. Applicants use both the term "STI region" and the term "insulating material" in claim 10 and hence, under the rule of claim differentiation, each term must mean something different. The Examiner cannot cite the same element in Hsu as teaching two different elements. Therefore, the Examiner has not presented a *prima facie* case of obviousness in rejecting claim 10, since the Examiner is relying upon an incorrect, factual predicate in support of the rejection. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998).

Claims 11 and 14-15 depend from claim 10 and hence are patentable over Hsu in view of Yang for at least the above-stated reasons. Claims 11 and 14-15 recite additional features, which, in combination with the features of the claim upon which they depend, are patentable over Hsu in view of Yang.

For example, Hsu and Yang, taken singly or in combination, do not teach or suggest "etching a portion of said protective cap to expose said remaining portion of said anti-reflective coating layer while maintaining protection of said insulating material" as recited in claim 11. The Examiner cites element 246 of Hsu as teaching a protective cap; element 241a of Hsu as teaching an anti-reflective coating layer and element 230 of Hsu as teaching an insulating material. Paper No. 7, page 7. The Examiner further cites Figures 5C-E of Hsu as teaching the above-cited claim limitation. Paper No. 7, page 7. Applicants respectfully traverse.

Hsu instead teaches that the planarization process is utilized to remove the insulating layer (element 246 which the Examiner asserts as teaching a protective cap) to the surface of the insulating layer (element 241). Column 4, lines 5-7. Hsu further teaches that the remainder of the insulating layer (element 247) is left within the opening (element 244). Column 4, lines 7-8. Hsu further teaches that for example, a chemical mechanical polishing process is utilized to polish the oxide layer (element 246) to the surface of the cap nitride layer (element 241). Column 4, lines 8-10. Hence, Hsu teaches removing the entire and not just a portion of the insulating layer (element 246 which the Examiner asserts as teaching a protective cap) as illustrated in Figure 5D. Thus, Hsu does not teach etching a portion of a protective cap.

Neither does Hsu teach etching a portion of the protective cap to expose a remaining portion of an anti-reflective coating layer. The Examiner had cited element 241a as teaching an anti-reflective coating layer. However, there is no element 241a in Figures 5C-E which the Examiner cites as teaching the above-cited claim limitation.

Neither does Hsu teach etching a portion of the protective cap to expose a

remaining portion of an anti-reflective coating layer while maintaining protection of an insulating material. The Examiner has cited element 230 of Hsu as teaching an insulating material. However, the Examiner has previously cited element 230 of Hsu as teaching an isolation region (Applicants assume the Examiner was referring to the STI region as claimed in claim 10). Paper No. 7, page 6. Applicants use both the term "STI region" and the term "insulating material" in claim 10 and hence, under the rule of claim differentiation, each term must mean something different. The Examiner cannot cite the same element in Hsu as teaching two different elements.

Thus, as a result of the foregoing, the Examiner has not presented a *prima facie* case of obviousness in rejecting claim 11, since the Examiner is relying upon an incorrect, factual predicate in support of the rejection. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998).

Applicants further assert that Hsu and Yang, taken singly or in combination, do not teach or suggest "etching said remaining portion of said anti-reflective coating layer" as recited in claim 11. The Examiner cites element 241 of Hsu as teaching a remaining portion and element 241a of Hsu as teaching an anti-reflective coating layer. Paper No. 7, page 7. Applicants respectfully traverse.

Hsu instead teaches that the conducting layer 240a and the insulating layer 241a are defined to form a floating gate 240 on the active region 200 and a cap layer 241 on the floating gate. Column 3, lines 52-55. Hsu further teaches an etching protection layer 245 is conformally formed extending from the isolation structure 230 within the opening 244 up to the cap layer 241. Column 3, lines 56-59. There is no language in Hsu that teaches etching element 241a (which the Examiner asserts as teaching an anti-reflective coating layer). Instead, Hsu teaches that the insulating layer 241a and the conducting layer 240a are defined to form a floating gate 240 on the active region 200 and a cap layer 241 on the floating gate. Furthermore, there is no language in Hsu that teaches etching a remaining portion of an anti-reflective coating layer. Applicants respectfully assert that there does not appear to be a connection between element 241 of Hsu and a remaining portion of an anti-reflective

coating layer. Applicants respectfully request the Examiner to more clearly explain the connection between the citation of element 241 of Hsu and a remaining portion of an anti-reflective coating layer pursuant to 37 C.F.R. §1.104(c)(2). Therefore, the Examiner has not presented a *prima facie* case of obviousness in rejecting claim 11, since the Examiner is relying upon an incorrect, factual predicate in support of the rejection. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998).

Applicants further assert that Hsu and Yang, taken singly or in combination, do not teach or suggest "wherein said insulating material is protected during etching of said remaining portion of said anti-reflective coating layer by said protective cap" as recited in claim 11. The Examiner cites element 230 of Hsu as teaching an insulating material; element 241 of Hsu as teaching a remaining portion; element 241a of Hsu as teaching an anti-reflective coating layer; and element 247 of Hsu as teaching a protective cap. Paper No. 7, page 7. Applicants respectfully traverse.

As stated above, the Examiner has previously cited element 230 of Hsu as teaching an isolation region (Applicants assume the Examiner was referring to the STI region as claimed in claim 10). Paper No. 7, page 6. Applicants use both the term "STI region" and the term "insulating material" in claim 10 and hence, under the rule of claim differentiation, each term must mean something different. The Examiner cannot cite the same element in Hsu as teaching two different elements. Hence, Hsu does not teach protecting an insulating material.

Further, as stated above, there is no language in Hsu that teaches etching a remaining portion of an anti-reflective coating layer. Applicants respectfully assert that there does not appear to be a connection between element 241 of Hsu and a remaining portion of an anti-reflective coating layer. Applicants respectfully request the Examiner to more clearly explain the connection between the citation of element 241 of Hsu and a remaining portion of an anti-reflective coating layer pursuant to 37 C.F.R. §1.104(c)(2).

Further, Hsu instead teaches that the planarization process is utilized to remove the insulating layer 246 to the surface of the insulating layer 241. Column 4,

lines 5-7. Hsu further teaches that the remainder of the insulating layer 247 is left within the opening 244. Column 4, lines 7-8. Hsu further teaches that for example, a chemical mechanical polishing process is utilized to polish the oxide layer 246 to the surface of the cap nitride layer 241. Column 4, lines 8-10. Hsu further teaches that the remainder of the oxide layer 247 is left within the opening 244. Column 4, lines 10-12. Hence, Hsu teaches that element 247 corresponds to oxide that is left within an opening. There is no language in Hsu that element 247 (Examiner asserts as teaching a protective cap) protects element 230, which the Examiner asserts as teaching an insulating material. Therefore, the Examiner has not presented a *prima facie* case of obviousness in rejecting claim 11, since the Examiner is relying upon an incorrect, factual predicate in support of the rejection. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998).

Applicants further assert that Hsu and Yang, taken singly or in combination, do not teach or suggest "wherein said remaining portion of said anti-reflective coating layer is etched using a plasma etch process" as recited in claim 14. Applicants further assert that Hsu and Yang, taken singly or in combination, do not teach or suggest "wherein said insulating material comprises thermal oxide" as recited in claim 15. The Examiner has not cited to any passage in either Hsu or Yang as teaching the above-cited claim limitations. In order to establish a *prima facie* case of obviousness, the Examiner must cite a reference or combination of references to teach or suggest all of the claim limitations. M.P.E.P. §2142. Since the Examiner has not cited to any passage in either Hsu or Yang as teaching the above-cited claim limitations, the Examiner has not established a *prima facie* case of obviousness in rejecting claims 14-15. M.P.E.P. §2143.

F. The Examiner has not provided any source of motivation for modifying Hsu and Yang with Tripsas.

The Examiner admits that Hsu does not teach "wherein said protective cap comprises photoresist material" as recited in claim 12. Paper No. 7, page 8. The Examiner further admits that Hsu does not teach "wherein said photoresist material has a thickness of about 800Å to 1200Å" as recited in claim 13. Paper No. 7, page 8.

The Examiner modifies Hsu and Yang with Tripsas to include the above-cited claim limitations "because the photoresist is deposited by spin-on, thus simplifies the process, hence more through put." Paper No. 7, page 8. The Examiner has not presented any source of motivation for modifying Hsu with Yang to include this missing limitation.

In order to support a *prima facie* case of obviousness, the Examiner must provide a source of motivation for modifying Hsu and Yang with Tripsas to include the above-stated missing limitations. M.P.E.P. §2142. The motivation to modify Hsu and Yang with Tripsas must come from one of three possible sources: the nature of the problem to be solved, the teachings of the prior art, and the knowledge of persons of ordinary skill in the art. *In re Rouffet*, 149 F.3d 1350, 1357, 47 U.S.P.Q.2d 1453, 1457-58 (Fed. Cir. 1998). The Examiner has not provided any evidence that his motivation comes from any of these sources. Instead, the Examiner is relying upon his own subjective opinion which is insufficient to support a *prima facie* case of obviousness. *In re Lee*, 61 U.S.P.Q.2d 1430, 1434 (Fed. Cir. 2002). Consequently, the Examiner's motivation is insufficient to support a *prima facie* case of obviousness for rejecting claims 12-13. *Id.*

G. The Examiner has not provided any objective evidence or motivation for modifying Hsu and Yang with Tripsas.

A *prima facie* showing of obviousness requires the Examiner to establish, *inter alia*, that the prior art references teach or suggest, either alone or in combination, all of the limitations of the claimed invention, and the Examiner must provide a motivation or suggestion to combine or modify the prior art reference to make the claimed inventions. M.P.E.P. §2142. The showings must be clear and particular and supported by objective evidence. *In re Lee*, 277 F.3d 1338, 1343, 61 U.S.P.Q.2d 1430, 1433-34 (Fed. Cir. 2002); *In re Kotzab*, 217 F.3d 1365, 1370, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000); *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999). Broad conclusory statements regarding the teaching of multiple references, standing alone, are not evidence. *Id.*

As stated above, the Examiner admits that Hsu does not teach "wherein said protective cap comprises photoresist material" as recited in claim 12. Paper No. 7, page 8. The Examiner further admits that Hsu does not teach "wherein said photoresist material has a thickness of about 800Å to 1200Å" as recited in claim 13. Paper No. 7, page 8. The Examiner modifies Hsu and Yang with Tripsas to include the above-cited claim limitations "because the photoresist is deposited by spin-on, thus simplifies the process, hence more through put." Paper No. 7, page 8. The Examiner's motivation is insufficient to establish a *prima facie* case of obviousness for at least the reasons stated below.

The Examiner's motivation does not address as to why one of ordinary skill in the art would modify Hsu with Tripsas to have protective cap comprising photoresist material with a thickness of about 800Å to 1200Å. Simply stating "because the photoresist is deposited by spin-on, thus simplifies the process, hence more through put" does not provide a motivation or suggestion for modifying Hsu with Tripsas to have protective cap comprising photoresist material with a thickness of about 800Å to 1200Å. The Examiner has provided no connection between having a protective cap comprising photoresist material with a thickness of about 800Å to 1200Å with the statement "because the photoresist is deposited by spin-on, thus simplifies the process, hence more through put." Instead, the Examiner is merely relying upon his own subjective opinion which is insufficient to establish a *prima facie* case of obviousness in rejecting claims 12-13. *In re Lee*, 61 U.S.P.Q.2d 1430, 1434 (Fed. Cir. 2002). The Examiner must provide objective evidence to support a motivation or a suggestion for modifying Hsu with Tripsas to have protective cap comprising photoresist material with a thickness of about 800Å to 1200Å. *Id.* Since the Examiner has not provided such evidence, the Examiner has not presented a *prima facie* case of obviousness in rejecting claims 12-13. *Id.*

H. By modifying Hsu with Tripsas, the principle of operation of Hsu would change.

As stated above, if the proposed modification or combination of the prior art would change the principle of operation of the prior art invention being modified,

then the teachings of the references are not sufficient to render the claims *prima facie* obvious. *In re Ratti*, 370 F.2d 810, 123 U.S.P.Q. 349 (C.C.P.A. 1959). Further, if the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984). For the reasons discussed below, Applicants submit that by modifying Hsu with Tripsas, the principle of operation in Hsu would change and subsequently render the operation of Hsu to perform its purpose unsatisfactorily.

As stated above, Hsu teaches a method for fabricating a non-volatile memory cell for a substrate includes the following steps: forming an isolation structure to define an active region on the substrate; forming a channel oxide layer on the active region; forming a conducting layer and a silicon nitride layer over the substrate; defining the polysilicon layer and the silicon nitride layer to form a floating gate on the active region and to form an opening exposing a portion of the isolation structure; conformally forming an etching protection layer which extends from the isolation structure inside the opening up to the silicon nitride layer; forming an oxide layer over the substrate; planarizing the oxide layer to the surface of the silicon nitride layer so that the remainder of the oxide layer is left within the opening; removing the silicon nitride layer; forming conducting spacers on the sidewalls of the remainder of the oxide layer; removing the remainder of the TEOS oxide layer; conformally forming an ONO layer; forming a controlling gate on the ONO layer; and forming source/drain regions. Abstract. Hsu further teaches that a method for improving the gate coupling ratio of a non-volatile memory cell in fabrication. Column 1, lines 8-10. Hsu further teaches that the prior art for improving the gate coupling ratio of a non-volatile memory cell mainly utilizes the polysilicon spacers formed by the liquid phase deposition process to increase the surface area of the insulating region between the floating gate and the controlling gate. Column 2, lines 17-23. Hsu further teaches that the main disadvantage of the foregoing prior art is that the process is complicated and difficult to control. Column 2, lines 25-26.

Tripsas, on the other hand, teaches providing arrangements to increase the process control during the fabrication of the floating/control gate configuration in a non-volatile memory semiconductor device. Abstract. Tripsas further teaches that one of the problems that has been encountered with reduced-size semiconductor devices is the tendency for deleterious cracks to form within control gate structures that employ a silicide layer. Column 2, lines 34-37.

By combining Hsu with Tripsas, Hsu would no longer be able to improve the gate coupling ratio of a non-volatile memory cell in fabrication. Hsu would be modified by Tripsas to instead provide arrangements to increase the process control during the fabrication of the floating/control gate configuration in a non-volatile memory semiconductor device. Tripsas teaches providing arrangements to increase the process control during the fabrication of the floating/control gate configuration in a non-volatile memory semiconductor device. Tripsas further teaches that the purpose of its invention is to reduce cracks forming within the control gate structures that employ a silicide layer. Hsu, on the other, teaches the purpose of its invention is to improve the gate coupling ratio of a non-volatile memory cell in fabrication. Hsu further teaches the steps in its Abstract in improving the gate coupling ratio. However, none of those steps are performed in Tripsas whose purpose is contrary to Hsu's purpose. Hence, by combining Hsu with Tripsas, Hsu would be modified to provide arrangements to increase the process control during the fabrication of the floating/control gate configuration instead of improving the gate coupling ratio of a non-volatile memory cell in fabrication. Thus, by modifying Hsu with Tripsas, the principle of operation in Hsu would change, and subsequently render the operation of Hsu to perform its purpose unsatisfactorily. Therefore, the Examiner has not presented a *prima facie* case of obviousness for rejecting claims 12-13. *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (C.C.P.A. 1959); *In re Gordon*, 733 F.2d 900, 221 U.S.P.Q. 1125 (Fed. Cir. 1984).

- I. The Examiner has not presented a reasonable expectation of success when combining Hsu with Tripsas.

The Examiner must present a reasonable expectation of success in combining Hsu with Tripsas in order to establish a *prima facie* case of obviousness. M.P.E.P. §2143.02.

As stated above, Hsu teaches improving the gate coupling ratio of a non-volatile memory cell mainly utilizes the polysilicon spacers formed by the liquid phase deposition process to increase the surface area of the insulating region between the floating gate and the controlling gate. Column 2, lines 17-23.

Tripsas, on the other hand, teaches providing arrangements to increase the process control during the fabrication of the floating/control gate configuration in a non-volatile memory semiconductor device. Abstract

The Examiner has not presented any evidence that there would be a reasonable expectation of success in modifying Hsu, which teaches improving the gate coupling ratio of a non-volatile memory cell, with Tripsas, which teaches providing arrangements to increase the process control during the fabrication of the floating/control gate configuration in a non-volatile memory semiconductor device. The Examiner must provide objective evidence as to how Hsu, which teaches improving the gate coupling ratio of a non-volatile memory cell, would be combined with Tripsas, which teaches providing arrangements to increase the process control during the fabrication of the floating/control gate configuration. M.P.E.P. §2143.02. Since the Examiner has not provided such evidence, the Examiner has not presented a reasonable expectation of success in combining Hsu with Tripsas. M.P.E.P. §2143.02. Accordingly, the Examiner has not presented a *prima facie* case of obviousness in rejecting claims 12-13. M.P.E.P. §2143.02.

J. Hsu, Yang and Tripsas, taken singly or in combination, do not teach or suggest the following claim limitations.

Applicants respectfully assert that Hsu, Yang and Tripsas, taken singly or in combination, do not teach or suggest "wherein said photoresist material has a thickness of about 800Å to 1200Å" as recited in claim 13. The Examiner cites element 40 of Tripsas as teaching a protective cap that includes photoresist material

with a thickness of 600Å to 1100Å. Paper No. 7, page 8. However, the Examiner has not cited to any passage in Tripsas as evidence that element 40 has a thickness of 600Å to 1100Å. Upon review of Tripsas, Applicants could not locate any passage that indicates the thickness of element 40. Therefore, the Examiner has not presented a *prima facie* case of obviousness in rejecting claim 13, since the Examiner is relying upon an incorrect, factual predicate in support of the rejection. *In re Rouffet*, 47 U.S.P.Q.2d 1453, 1455 (Fed. Cir. 1998).

V CONCLUSION

As a result of the foregoing, it is asserted by Applicants that claims 1-5 and 10-15 in the Application are in condition for allowance, and Applicants respectfully request an allowance of such claims. Applicants respectfully request that the Examiner call Applicants' attorney at the below listed number if the Examiner believes that such a discussion would be helpful in resolving any remaining issues.

Respectfully submitted,

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IN THE DRAWINGS

Applicants have attached a new sheet with a newly added Figure, "FIG. 3G", illustrating the etching of the remaining portion of the anti-reflective coating layer. Applicants note that this is not new matter and that support for this new Figure, FIG. 3G, is found at least on page 9, lines 1-7 of the Specification and at step 212 of Figure 2.

Attachment: New Sheet